

Date: Wednesday, 10/31/2007 3:26:15 PM
 User: Kim Johnston

Process Sheet

Customer	: CU-DAR001 Dart Helicopters Services	Drawing Name	: ROUND BILLET 17-4
Job Number	: 35478A		
Estimate Number	: 10041		
P.O. Number	: N/A	Part Number	: D6104007
This Issue	: 10/31/2007 S.O. No. : N/A	Drawing Number	: D6104 REV B
Prsht Rev.	: NC	Project Number	: N/A
First Issue	: N/A Type : MACHINED PARTS	Drawing Revision	: B
Previous Run	: 32780A	Material	: N/A
Written By	: _____	Due Date	: 11/20/2007 Qty: 10 Um: Each
Checked & Approved By	: <u>490711.01</u>		
Comment	: Est. A: 01.05.08 New Issue EC		

Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
---------	-----------------------	---------------

1.0

PG

PURCHASING



Comment: PURCHASING

Issue P/O: 4963

a) Description: S.S. round billet

b) Ø4.50" x 5.10" long

c) Tolerance on all dimensions are +0.030"/-0.000"

d) Material: 17-4PH Stainless steel (Ams 5643 or Aisi 630)

e) One blank makes 2 parts

f) Material certification required

CL07/11/02

(10)

2.0

D6104007P

17-4 SS Roundbar 4.50"OD



Comment: Qty.: 1.0000 Each(s)/Unit Total: 10.0000 Each(s)

17-4 SS Roundbar 4.50"OD

3.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Receive & Inspect For Transit Damage

Ensure material certification is attached

7-11-15

SQ

(10x)

4.0

QC6

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

Ensure Material certification comply to Dwg D6104

CL07/12/06

(10x)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: D Date: 08/10/09
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Date: Wednesday, 10/31/2007 3:26:16 PM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: ROUND BILLET 17-4

Job Number: 35478A

Part Number: D6104007

Job Number:



Seq. #:

Machine Or Operation:

Description :

5.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and Stock

Location: *enc cell*

5/21/06

6.0

QC21

FINAL INSPECTION/W/O RELEASE



10

Comment: FINAL INSPECTION/W/O RELEASE

12/08/06/09

Job Completion



2008/1/8

NA

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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NOTE: Date & initial all entries

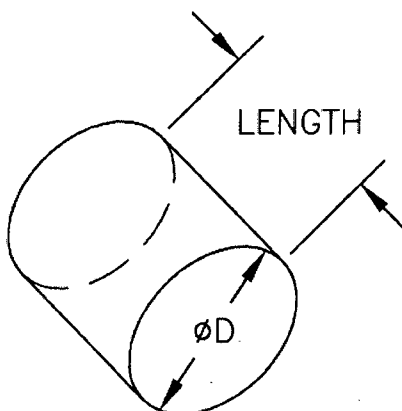


DESIGN F.F.	DRAWN BY [Signature]	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
CHECKED [Signature]	APPROVED [Signature]	DRAWING NO. D6104	Rev. B SHEET 1 OF 1
DATE 02.11.25		TITLE ROUND BILLET, 17-4	SCALE NTS
A	01.04.10	NEW ISSUE	
B	02.11.25	CLARIFY ALLOY SPEC ADDED D6104-009/-011 REDUCE LENGTH OF BILLETS	

RELEASED

02.11.29 [Signature]

SPECIFICATION CONTROL DRAWING



MATERIAL: 17-4 PH SS (AMS 5643 OR AISI 630) MIN UTS = 170 KSI (38 HRC)

PURCHASE MATERIAL ACCORDING TO THE FOLLOWING TABLE. SPECIFY ALLOY, DIAMETER x LENGTH (+0.030/-0.000) AS SHOWN.

TOLERANCE ON ALL DIMENSIONS IS +0.030/-0.000.

ALL DIMENSIONS ARE IN INCHES

Part No.	Alloy	D (Diameter)	Length
D6104-001	17-4 PH STAINLESS STEEL	Ø3.00	3.80
D6104-003	17-4 PH STAINLESS STEEL	Ø3.25	3.80
D6104-005	17-4 PH STAINLESS STEEL	Ø4.00	5.10
D6104-007	17-4 PH STAINLESS STEEL	Ø4.50	5.10
D6104-009	17-4 PH STAINLESS STEEL	Ø5.25	4.10
D6104-011	17-4 PH STAINLESS STEEL	Ø6.50	4.10

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 35478A

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| COMPTE-ACQ. | VERUSIS | ERK. EXPEDIE TRANSMIT VIA

NO. FEVILLE/EMBALLAGE-B/L NU

FEUILLE D'EMBALLAGE - PACKING S

OUTOKUMPU**Certificate of Test*******
* CERTIFICATION *
*****

HEAT 514633 ORDER 0494057/002 SON 29186D BOL 0145113 TAG 1876578 09/05/07

SHIP TO:
ENERGY STEEL PRODUCTS
10002 WINDFERN RD.
(800-231-0016)
HOUSTON

TX 77064

----- YOUR ORDER & DATE -----
92538-OP 9/05/07 CUST# ENESTR01 CUST TAG#11904505----- ITEM DESCRIPTION -----
GRADE 17-4
Size 17-4 HRART RND BAR 4-1/2 STD Country of Melt: USA
Ship Condition A Country of Mfg.: USA
NAFTA Country of Origin is Country of Melt

Total Bundles 2 SON Weight 4346

----- SPECIFICATIONS -----
 THE PRODUCTS LISTED ON THIS MILL TEST REPORT SATISFY PREFERENCE CRITERION B
 AS DEFINED IN ARTICLE 401 OF THE NORTH AMERICAN FREE TRADE AGREEMENT.
 AMS 2303E
 ASME SA564 TYPE 630 B04 A05
 ASTM A564 04 TYPE 630
 ANNEAL 1900F/30MIN/RAPID COOL
 BSP/UNALLOY-IWRC MS-SS1 REV 3
 FREE OF MERCURY CONTAMINATION
 AMS 56430
 ASTM A184 06B
 ASTM E112 96
 UNS S17400, AISI 630
 NO WELD REPAIR

----- MECHANICAL & OTHER TESTS -----
 Test Condition H900
 Hardness as shipped 286 HBW
 Hardness as tested (30 HRC) 400 HBW
 Grain size 6.5
 Tensile strength, KSI (MPa) 203.0 (1400)
 0.2% Yield Strength, KSI (MPa) 181.0 (1248)
 Micro OK
 Intergranular corrosion OK
 Macro OK
 Elongation % in 4D 13.0
 Reduction of area % 40.0
 Ferrite .0
 Hardenability 43 HRC

----- CHEMICAL COMPOSITION -----

Carbon (C)	.008	Manganese (Mn)	.710
Phosphorus (P)	.021	Sulphur (S)	.025
Silicon (Si)	.360	Chromium (Cr)	15.430
Nickel (Ni)	4.710	Cobalt (Co)	.030
Copper (Cu)	3.430	Moly (Mo)	.110
Nitrogen (N)	.031	Columbium (Cb)	.300
Titanium (Ti)	.005	Aluminum (Al)	.003
Tin (Sn)	.005	Cerium (Ce)	.010
Boron (B)	.001	Tantalum (Ta)	.005
Vanadium (V)	.025		.000
Columbium/			
Tantalum (Cb+Ta)	.305		
Iron (Fe)	Balance		
Frequency	.000	Severity	.000
Melt Practice	RAF		
Refining Practice	AOD		
De-long Ferrite			

This report is a copy of original
mill certificate and verifies
that the product meets the
requirements as originally ordered
by Energy Steel Products.

DATE: 9-13-07 VERIFIED BY: [Signature]

Knowingly & willfully falsifying or concealing a material act on this form,
or making false, fictitious or fraudulent statements or representations
herein could constitute a felony punishable under federal statutes.

We hereby certify that the test results shown in this report are correct and
accurate as contained in the records of the company and are in compliance
with the specifications, codes, and standards listed above.

Outokumpu Stainless Bar, Inc.
3043 Greenway Pkwy.
Richburg, SC 29728

M.P. Marcanio, Quality Manager

CASTLE METALS CORP.

DATE RCVD 10/28/07

IAC 14998

APPROVED BY [Signature]

AMS 5643 / AMS 5622 (17-4PH)

17%Cr 4%Ni Precipitation Hardening Stainless Steel Single Melted or Vacuum Arc Remelted (VAR)

Features & Benefits

- Medium to high strengths developed by appropriate ageing treatment
- Corrosion resistant
- Good transverse properties in remelted grade

Applications

- Aircraft structural parts

Supply Condition & Availability

- Supplied as solution treated bright machining quality bar
- Also available on request aged to specific "H" condition
- Stock sizes range 12.7 mm - 250 mm dia.
- Other sections on request

Related specs

MSRR 6601
Z7 CNU17.04
1.4548

Chemical Composition (Wt %)

	Min	Max
C	-	0.07
Si	-	1.00
Mn	-	1.00
P	-	0.040
S	-	0.030
Cr	15.00	17.50
Mo	-	0.50
Ni	3.00	5.00
Nb (Cb)	5xC	0.45
Cu	3.00	5.00

Final Heat Treatment

Solution treat @ 1038°C. Age @ appropriate temperature for relevant "H" condition.
(Hxxx condition aged at xxx°F).

Mechanical Properties

Condition	0.2% Proof Stress MPa	Tensile Strength MPa	Elongation		Reduction of area		Hardness	
			%		%		HB	
			Min		Min		Min	Max
	Min	Min	Long.	Trans.	Long.	Trans.		
H900	1172	1310	10	6	35	20	388	444
H1000	1069	1172	10	7	38	25	375	429
H1025	1000	1069	12	8	45	32	331	401
H1050	862	1000	13	9	45	33	311	375
H1100	793	965	14	10	45	34	302	363
H1150	724	931	16	11	50	35	277	352

Specified strength levels refer to both Transverse and Longitudinal directions.

N.B. 1Mpa = 1 N/mm²